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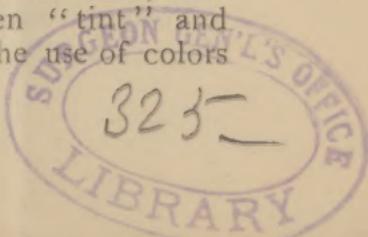
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## A SIMPLE METHOD OF TESTING FOR COLOR-BLINDNESS.

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THE genuine expert no doubt finds little difficulty in estimating, by the use of one of the recognized methods of testing for color-blindness, the color sensibility of persons presented to him. But probably few of those who desire to make such tests have had the advantage of such long and continued practice as does away with the necessity for more or less elaborate reasoning during the experiment itself. Every one who has engaged in such work according to the justly famous method of Professor Holmgren, has recognized that the individuality of the person experimented on offers the greatest difficulty in the way of making the test rapid and accurate. An indefinite number of gradations lead through color-obtuseness down to color-blindness, and the fineness of color-perception in different individuals, determined simply by education, is notoriously of the greatest diversity. It is, therefore, not to be wondered at when, according to the Holmgren method, a skein of worsted is presented to a person under examination, and he is told to pick out all the pieces of a similar color from a bundle of skeins, he should hesitate between the meaning of "color" and "shade," and become still more perplexed if the examiner, in his desire to make matters clear, tries to indicate the difference between "tint" and "hue." All persons untrained in the use of colors



whom I have examined for color-blindness have needed a more or less lengthy explanation of terms before understanding exactly what was desired of them.

The method which I venture to propose is a modification of that of Professor Holmgren, and appears to me to be in some respects an improvement, on account of its accuracy and the ease with which it may be applied. The only material employed in the tests is furnished in the folding sample-cards of worsted colors such as are used by dealers in worsteds and embroidery in making their orders for Berlin wools. The wools are fastened to narrow pieces of cardboard, five to fifteen shades of a single color being arranged in regular gradation upon each piece. Each tint or shade is represented by six or eight short strands of worsted set closely side by side, and separated by a blank space of one-fourth of an inch from the next lighter or darker shade. Any one can easily make such a color-card by winding separately the various shades of any color around a strip of cardboard ten inches by one inch in size, taking care that each shade shall be separated by an open space from the adjacent ones. The woollen threads can be kept in place by tying, or fastening with a drop of mucilage on the reverse side of the slip of cardboard. The slips containing the different colors should be lettered, A, B, etc., and each individual shade should be numbered for the purpose of reference.

The book of samples chiefly used by me contains eighteen columns of colors, each of which is represented by five to fifteen separate tints in graded series. In practice so extensive a collection is not needed, but a single column each of reds, blues, pure greens, grays, pinks, royal purples and violets, is sufficient; to these, however, it is useful to add series of browns and yellows. Ten to fifteen shades of each color should be employed.

In making the color-test, the operator may proceed in the order indicated by Holmgren, investigating first the general color-sense, and afterward the special variety of color blindness.

The examiner chooses a light green as a test color, and then, pointing the finger at the column of grays, asks the person under examination to pick out a shade which *exactly* resembles the test green. The same comparison is successively made between the green and the purples, reds, and blues. A person afflicted with any form of color-blindness will either declare that the test green is exactly like some shade of the comparison colors or differs from it only in brightness. The operator may now proceed to the second test, and this is really the first step pursued by the author, by choosing a pink, which is physically a combination of blue and red, and, pointing to the column of blues, ask the subject to select a shade which exactly corresponds to the test pink. The same comparison may then be made with the violets, grays, and greens. According to Holmgren,<sup>1</sup> "He who is color-blind by the first test," matching the test green, "and who, upon the second test, selects only purple skeins"—that is, makes no error by the second test of the method here detailed—"is *incompletely color-blind*. He who in the second test," matching the purple, "selects with purple only the blue and violet, or one of them, is *completely red-blind*. He who in the second test selects only green and gray, is *completely green-blind*." The examiner may then go on and, using red as a test color, find out what saturation of gray, brown, or green exactly corresponds with it.

I have had no experience with the green-blind, but, in the case of red-blind persons who have been examined by me, the rapidity and certainty of this

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<sup>1</sup> Smithsonian Report, 1877, p. 186.

method have left nothing to be desired. In one instance, while still a novice in this kind of experiment, I found it impossible to determine, by the Holmgren method, just the nature of the defect of color-perception in a student who was being examined; but, on adopting the plan here detailed, it took but a few seconds to find the nature and depth, as it were, of his color-blindness.

In the case of feigned color-blindness, the deceit can only be practised successfully in this, as in the original method, when the person examined understands the laws of the defect as well as does the examiner.

Many examiners have had much wider experience than myself in making these tests, but I venture to believe that the plan here proposed has peculiar advantages, because—

1. It leaves nothing to the judgment of the person examined. He is asked simply to select some color which is *exactly* like one other. The large number of shades of color, and the simplicity of their arrangement, allows of this being done definitely and quickly. No color-name is used, and thus all confusion of meaning is avoided.

2. The method allows of a scientific accuracy equalled only by that of some others of a much more complicated character; the color-blind matches two different colors which *exactly* resemble each other, thus giving a clew to the completeness of the defect.

3. The time and worry of the examination are reduced to a minimum. An ignorant person might be taught in a few minutes how to conduct the test, or be trusted to depend on printed instructions, as "Does any number of column C look *exactly* like No. 3 of column A?" etc.

The whole number of color-slips may be fastened in a folding cardboard small enough to be conveniently carried in the pocket.